

CLAIMS

1. A method of delaminating a graphite structure, the method comprising:
diffusing a coating agent in a supercritical fluid between layered particles of a graphite structure defining contacted graphite particles; and
catastrophically depressurizing the supercritical fluid to form delaminated graphite particles.
2. The method of Claim 1 further comprising mixing the delaminated graphite particles with a polymer to form a graphite-polymer nanocomposites.
3. The method of Claim 1 wherein the supercritical fluid comprises carbon dioxide, ammonia, methane, ethane, or ethylene or a mixture thereof.
4. The method of Claim 1 wherein the coating agent comprises a polymer, an oligomer, a monomer, or an oil or a mixture thereof.
5. The method of Claim 1 wherein the coating agent is polydimethylsiloxane having weight average molecular weights between about 30000 and 200000.
6. The method of Claim 1 wherein the graphite structure comprises natural graphite and synthetic graphite.
7. The method of Claim 1 wherein the synthetic graphite comprises expandable graphite.
8. The method of Claim 1 wherein the graphite structure is in the form of powder with an average particle size of between about 0.5 and 3 μm .

9. The method of Claim 1 wherein diffusing the supercritical fluid and the graphite structure is performed for a time between about 10 minutes to 24 hours.

10. The method of Claim 1 wherein catastrophically depressurizing the contacted graphite particles is performed in between about 5 and 30 seconds.

11. The method of Claim 1 wherein the layered particles are held together by covalent bonds and wherein catastrophically depressurizing the contacted graphite particles comprises exfoliating the contact layered particles and reducing reformation of the covalent bonds.

12. The method of Claim 1 wherein catastrophically depressurizing the contacted graphite particles is performed at a predetermined rate of between about 0.1 and 5 milliliters per second.

13. The method of claim 1 the weight ratio of the graphite structure to the coating agent is at least about 1:10.

14. A method of preparing graphite-polymer nanocomposites, the method comprising:

diffusing layered graphite particles having covalent bonds with a coating agent solubilized in a supercritical fluid to intercalate the coating agent between the layered graphite particles defining contacted graphite particles;

catastrophically depressurizing the contacted graphite particles to exfoliate the contacted graphite particles and reduce reformation of the covalent bonds, the coating agent being precipitated from the supercritical fluid and deposited on the contacted graphite particles during depressurization, defining delaminated graphite particles; and

mixing the delaminated graphite particles with a polymer to form graphite-polymer nanocomposites.

15. A delaminated graphite structure comprising:
exfoliated layered graphite particles coated with a coating agent and
substantially singly dispersed apart from each other.

16. A graphite-polymer nanocomposite comprising delaminated graphite
particles coated with a coating agent and dispersed in a polymer.